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Improving inclusion, competitiveness, and sustainability in midstream Honduran coffee chains

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Abstract: *This article presents a systematic comparison between conventional and 'differentiated' coffee value chains, paying attention to (micro and macro) economic performance and environmental outcomes at different midstream segments of the Honduran coffee value chains. Growth has been strong in the Honduran coffee sector, especially among coffee cooperatives and commercial enterprises devoted to the production of 'differentiated' coffees at premium prices. We rely on a systematic data inventory of input use, costs, and benefits of all agents involved at different midstream stages of the coffee value chains to compare their performance. We find that midstream integration is critical for yield and quality improvement of Honduran coffee. This can be reinforced through voluntary certification (mainly for organic produce) and branding. Moreover, upgrading of conventional coffee for sales at local and regional markets offers some promising prospects for inclusion and sustainability.*

Keywords: coffee, midstream, value chain, certification, externalities, Honduras

Introduction

COFFEE PRODUCTION HAS A LONG history in the Central Americas, in which Honduras is a latecomer and most of its coffee was originally devoted to domestic consumption. A major expansion of Honduran coffee areas took place in the 1960s as a result of the land reform programme that enabled land titling to smallholder parcels planted with perennial coffee plants (Jansen, 1998). Moreover, the improvement of rural feeder roads and the establishment of coffee cooperatives with shared processing facilities supported coffee development. Although Arabica coffee production in Honduras takes place in highland areas beyond 1,000 m above sea level and is classified as '(Strictly) High Grown' (SHG) quality, the mixture of different coffees during coffee washing and processing affects the consistency of quality and reputation. Consequently, coffee from Honduras is valued systematically at a price 20 per cent lower than neighbouring Guatemala and even 30 per cent below the average export price received by producers in Costa Rica (CRS, 2015) (see also Table 1).

The Honduran coffee sector has faced some serious challenges in the last decades due to devastating natural hazards (Hurricane Mitch, 1998), the impact of the coffee

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Table 1 Exported unit value in US$ per tonne for Central American coffee producers

	2016	*2017*	*2018*	*2019*
Costa Rica	4,094	4,435	4,212	4,400
El Salvador	3,726	3,707	3,223	3,120
Guatemala	3,576	3,678	3,304	3,068
Nicaragua	3,414	3,406	3,031	2,672
Honduras	2,771	2,963	2,585	2,318

Source: UN Comtrade

rust outbreak (2012), and highly irregular rainfall patterns due to climate change and reinforced by the El Niño phenomenon (2015). Covid-19 lockdowns and border restrictions also limited coffee production in Honduras, further aggravated when two Category 4 hurricanes (named Eta and Iota) hit the country at the end of 2020. Mobility restrictions caused labour shortages at harvest and exports decreased by more than 15 per cent in 2020 due to lower international demand (ICO, 2020). Production forecasts for 2021/22 show a slight reduction in volume, due to a higher incidence of leaf rust, delays in post-hurricane road infrastructure rehabilitation efforts, and continuously high Covid-19 incidence. On the other hand, international coffee prices are gradually rising again and export revenues may become substantially higher.

A massive coffee rust control programme with replacement of coffee trees by more resistant coffee varieties, technical training, certification schemes from Rainforest Alliance, UTZ, Fairtrade and organic, and financial assistance for smallholder coffee producers enabled the country to quickly recover and boost coffee production (Avelino et al., 2015). Consequently, since 2011 Honduras has been Central America's largest producer of green coffee beans (with 40 per cent of regional production) and in 2021 it ranks sixth in the world and is the second-biggest exporter of high-quality Arabica beans.

The increasing coffee production in Honduras has both micro- and macroeconomic implications. Coffee cultivation is mainly undertaken by up to 120,000 smallholder producers with areas up to 7 ha. During the harvest period (November to March) some 300,000 temporary workers are employed; one-third migrate from neighbouring countries (Guatemala and Nicaragua). Including family members, this implies that up to 2 million people or some 30 per cent of the population are directly or indirectly engaged with the coffee sector. Coffee generates gross exports valued at more than US$900 m, making it the country's main export crop accounting for 20–22 per cent of export revenues. Europe is the main destination of Honduran coffee (75–80 per cent), followed by the United States (15 per cent). The share of certified (or differentiated) coffees is growing and already represents 20 per cent of coffee exports, mainly under Fairtrade (7 per cent), Organic (3.5 per cent), and UTZ/Rainforest Alliance (4.7 per cent) standards.

Whereas a wide range of field studies are available that assess farm-level implications of coffee certification for the income of smallholder households

(Chiputwa et al., 2015; Ruben and Fort, 2012; Meemken, 2020) and the prospects for sustainable resource management (Mitiku et al., 2017), far less attention is usually given to the value-added distribution along the coffee supply chain. Recently, some studies have started to address the living wage of worker families and wider labour market implications (Akoyi and Maertens, 2016). But analyses of the midstream distribution of revenue shares accruing to input providers, traders, processors, exporters, and retailers are almost absent. Moreover, macroeconomic implications of certification for the wider growth potential and the effects on income distribution are barely addressed.

In this article, we systematically compare the micro- and macroeconomic effects of conventional and certified coffee production, processing, and trade, paying specific attention to the net value added generation for Honduran society, the revenue distribution among midstream stakeholders, and the sustainability effects at different supply chain stages. This enables us to appreciate net socio-economic and ecological contributions of different coffee chains to the national economy and the distribution of coffee revenues to different stakeholders. The latter information allows us to identify the major linkages between primary coffee producers and other supply chain agents, and to generate additional insights into the opportunities for reinforcing the competitiveness of coffee chains.

The remainder of this article is structured as follows: First, we outline the structure of the coffee value chains in Honduras and identify key drivers underlying the recent development of the coffee sector. Hereafter, we present the procedures used for field data collection on the input use and cost structure in different coffee value chains, then we discuss the economic and environmental indicators and the macroeconomic competitiveness. The article concludes by identifying some strategic opportunities for coffee upgrading and indicates implications for future coffee support policies.

Coffee development in Honduras

The coffee sector in Honduras shows vibrant development and has exhibited dynamic growth during recent years. Whereas some area expansion has still been reached, major growth has taken place in yields. However, current yield levels of 1,643 kg of green coffee beans per hectare (25 quintals per *manzana*) are less than half the level of potentially attainable yields. Importantly, coffee yields tend to be substantially higher at more diversified smallholder farms that rely on integrated nutrient and pest management and permit multiple harvesting rounds. This inverse relationship between farm size and yield implies, however, that labour returns – and thus income – tend to be lower for smallholder farmers.

Annual coffee production in Honduras averaged 3 million bags between the 2001/2002 and the 2009/2010 seasons, growing to 4.2 million bags for the 2009/2010 harvests and increasing to 6.1 million bags in 2020/2021 (see Figure 1). The widespread presence of the coffee leaf rust fungus disease in Honduras occasionally drives production down. Over the years, the macroeconomic significance of the coffee sector is increasing, both in terms of export value ($850–1,100 m) as well as in terms of the total wage bill (up to $70 m).

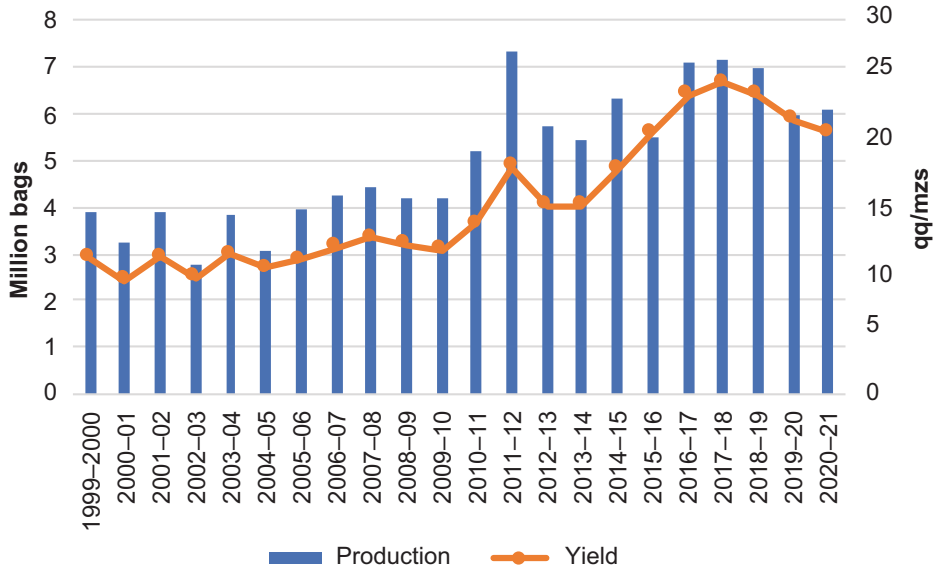

Figure 1 Honduras: coffee production and yields (1999–2021)
Note: 1 quintal equals 46 kg; 1 manzana equals 0.7 hectare
Source: IHCAFE

The Honduran coffee sector can be divided between conventional and certified (or differentiated) coffee. Most conventional coffee is produced on small farms (<3.5 ha) and 85 per cent of their coffee production is sold as washed coffee at the farm gate to local traders, sometimes even before the harvest. Farmers only perform some wet processing, but traders take care of dry processing services. Certified (differentiated) coffee is mostly produced by medium-size commercial farmers that belong to farmers' groups or cooperatives. The latter take care of integrated wet and dry processing at an established fee and may even own export licences that enable direct contracts with certified buyers.

The coffee value chain in Honduras provides linkages between these different types of producers with three categories of market outlets: international exports through licensed traders, illegal regional smuggling to neighbouring countries, and deliveries to local processors for sales on the domestic market (see Figure 2).

The development potential of the Honduran coffee sector also depends on some external factors. Most importantly, the public sector is heavily involved in the regulation of internal and external trade (licensed buyers) and levies taxes on local coffee deliveries (of about $3.5/quintal = $76/tonne), retaining a fee of $9 per quintal ($196/tonne) for the national coffee trust fund that can only be reclaimed by farmers upon presentation of the export certificate. This mechanism is set in place to hinder illegal exports but also guarantees that farmers repay their debts on outstanding bank loans.

Other major challenges for the sustainability of Honduran coffee production are risks that are likely related to climate change, such as increasing crop losses due

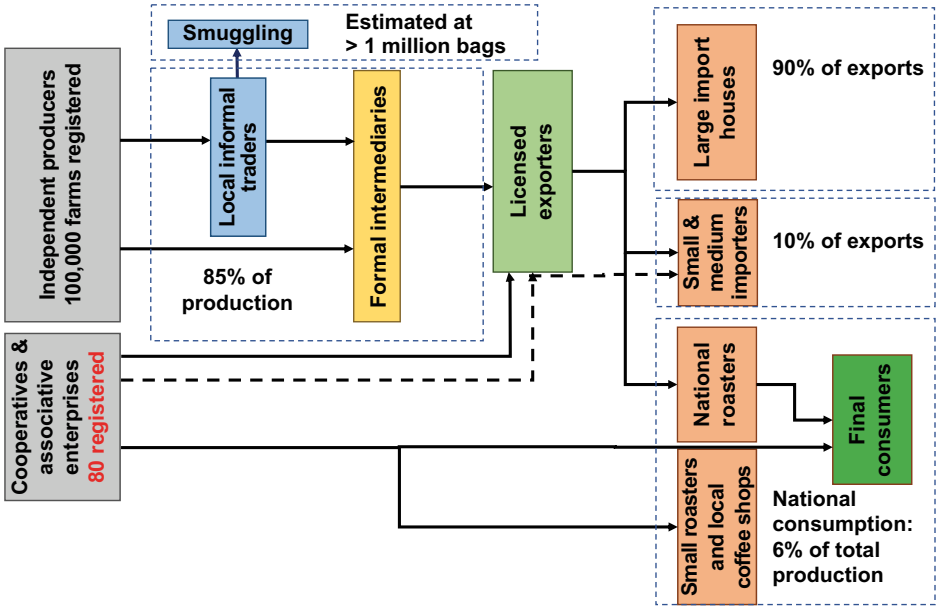

Figure 2 Value chain map of coffee in Honduras
Source: Ruben et al., 2018

to diseases that are more persistent at higher temperatures, driving some farmers to shift coffee cultivation towards higher altitudes (Läderach et al., 2010). Further incentives for enhancing the competitiveness of the coffee sector require better access to key fertilizer inputs and farmer training and extension services for better plant maintenance and crop management under changing climatic circumstances.

The competitiveness of the Honduran coffee sector is thus mainly dependent on the so-called midstream segments of the value chain (Reardon, 2015). This 'hidden middle' comprises input dealers, traders, transporters, processors, and exporters who create and capture a major share of value added. Midstream responses to external shocks such as Covid-19 create opportunities for value chain cooperation and (co)innovation (Reardon et al., 2021). Improving backward linkages to increase yields and maintaining productivity in coffee production and upgrading forwards linkages to support quality upgrading in coffee processing are critical to enable smallholders to gain a larger value-added share.

Materials and methods

The field research was part of an ongoing AGRINATURA programme 'Agricultural Value Chains for Development' (AVC4D) that aims to provide better understanding of midstream competitiveness. This programme is particularly interested in identifying investment and innovation opportunities that could contribute to value added generation, sustainable development, and more equitable distribution of benefits throughout the value chain (see European Union, 2017, for further details).

We relied on an integrated approach for analysing the cost structure and value-added distribution between all agents involved in two different types of coffee value chains (conventional and certified), and subsequently estimated the economic contribution of both chains to the national economy of Honduras. This unique combination of microeconomic analysis at value chain level and macroeconomic analysis at country level permits us to assess economic returns derived from the current institutional structure of the coffee value chain, as well as to identify potential development opportunities for future upgrading of the coffee sector.

Data collection took place in two typical field sites that are different in terms of agroecological potential and farm structure. The first site, El Paraíso, is located in southern Honduras. Coffee production is mainly done by smallholder farms using low input coffee systems that reach rather marginal yields (average 1,311 kg per hectare or 20 quintal per manzana). Most coffee is directly sold to local intermediaries who take care of drying and further processing. The second site, Corquín, is located in western Honduras. Its coffee production is more intensified and therefore higher yields are realized (average 2,958 kg per hectare or 45 quintal per manzana). The well-known inverse relationship between farm size and coffee productivity is illustrated in Figure A1. Moreover, farmers in Corquín are better organized in cooperatives or peasant enterprises that operate their own wet and dry processing facilities and have export licences. In both sites, an important share of production for certified outlets takes place (up to 30 per cent). Coffee production for the national market mostly originates from some larger estates in El Paraíso that are connected with toasting factories and even operate a network of local coffee shops.

We used field data from input providers, producers, private and cooperative processors, and local as well as international traders to construct a typical supply chain for delivering one quintal of coffee ready for exports at the border and/or for sales at the local market. We used AFA software developed by CIRAD to normalize the technical transformation from red coffee berries to green coffee and to calculate key economic indicators for different stakeholders in the value chain.

For the macroeconomic analysis at national level we assessed the domestic resource costs and considered different degrees of producer support in the conventional and differentiated (certified) coffee chains. This provides insight into how differences in relative market prices and production and processing technologies (i.e. reliance on tradable inputs and domestic factors) influence the outcomes at the country level.

For calculating the environmental externalities, we used the Life Cycle Assessment (LCA). This includes the extraction of all required natural resources, polluting emissions, and land use during the production of all significant inputs and coffee production stages down to the port of export. The reference unit is one tonne of green coffee beans. The EF Life Cycle Impact Assessment method (Fazio et al., 2018) is used for calculating the impact indicators. Normalization and weighting is applied as recommended by the European Commission (2017). The total single score is converted from points to kg CO2eq, as this is the most determining impact category. To assess global environmental externalities, the total score in kg CO2eq is valued by the social cost of carbon. This cost is estimated to be plausible at $220 per tonne of CO_2 (Fitzpatrick et al., 2017).

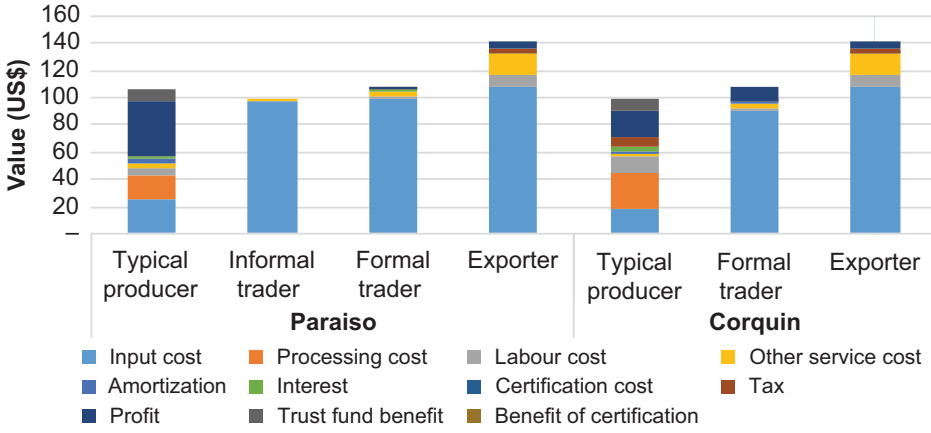

Figure 3 Production value in the conventional coffee chain in El Paraíso and Corquín (in $/quintal Café Oro)

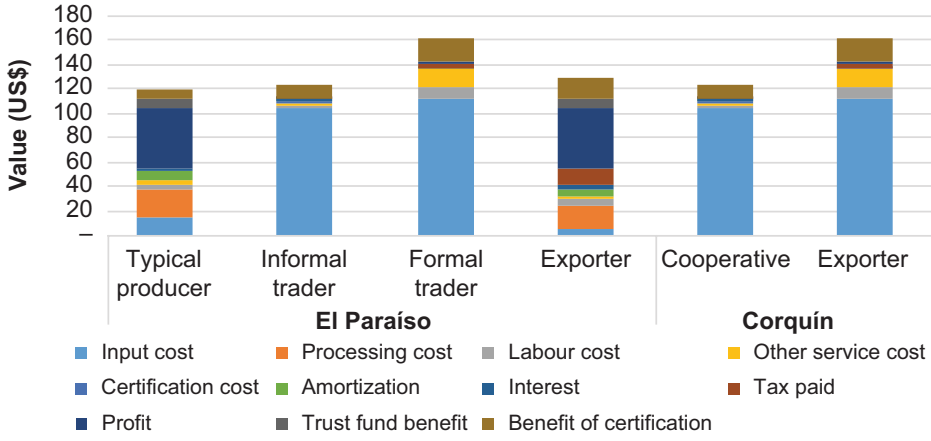

Figure 4 Production value in the certified coffee chain in El Paraíso and Corquín ($/quintal Café Oro)

Results

Cost structure and value added distribution

We first calculated the production and processing costs and net revenues for delivering one quintal of green coffee in both field sites from a typical producer that delivers either to the conventional or the certified market (see Figures 3 and 4).

The costs structure is presented for a 'typical' producer that is fairly small (1.4–4.3 ha) in El Paraíso and somewhat larger (7–21 ha) in the Corquín region. Certified farms usually belong to the medium size segment (2–7 ha) and can be up to 21 ha. Conventional coffee producers from El Paraíso receive higher net rewards due to their limited reliance on hired labour for maintenance and harvesting. Moreover, input and capital costs tend to be lower as well in these

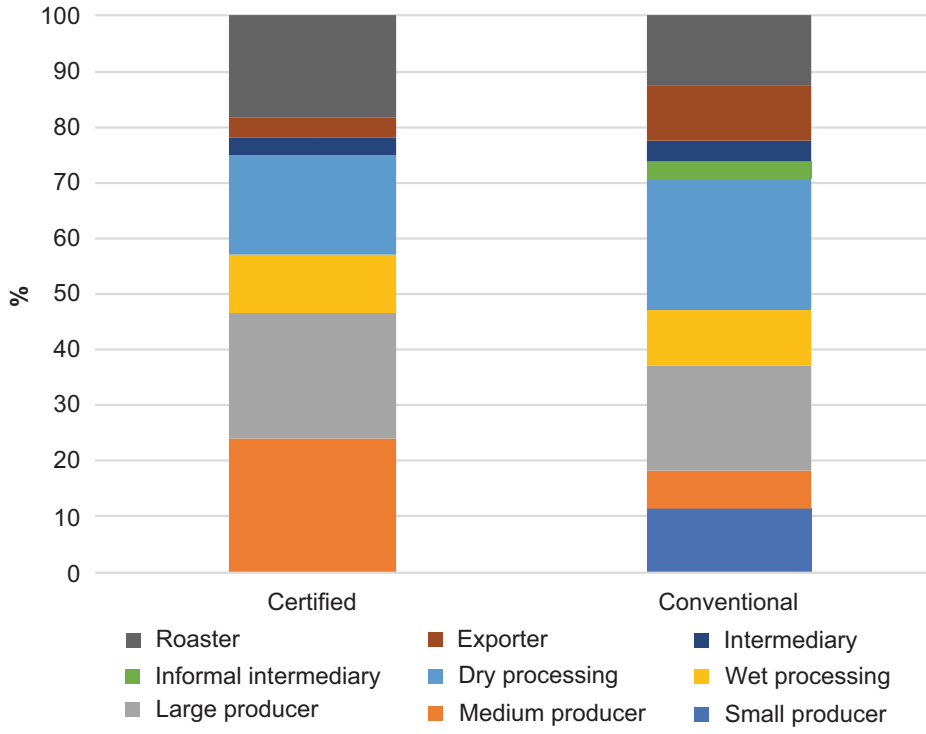

Figure 5 Surplus distribution between stakeholders in conventional and certified value chains

less intensive production systems. For certified coffee, the situation is different. Production costs are lower in Corquín due to more efficient input use and better local availability of key inputs and higher coffee yields. Certified producers are also closely integrated with wet and dry processing facilities. The disadvantage is that producers and processors are subject to taxation, but otherwise they receive a certification premium.

If we further aggregate towards the national level we can assess the functional distribution of different cost and benefit components over the different stakeholders involved in the supply chain (see Figure 5). For the sake of comparison, we divide the percentage shares of all costs categories over the final sales price. This provides insights into the relative importance of different cost categories (input, salaries, services, capital depreciation) as well as the financial transfers to/from private and public agencies (credit, taxes, trust fund payments). Note that in absolute terms the price of certified coffee is at least 15–20 per cent higher than conventional coffee.

The producers' share of value-added (or operational surplus) is substantially larger in the certified value chain, whereas dry processing facilities receive a smaller value-added share in the certified chain compared to conventional outlets. This is because the processing and trade of certified coffee are better integrated with primary production. Moreover, the conventional coffee chain has to bear more local

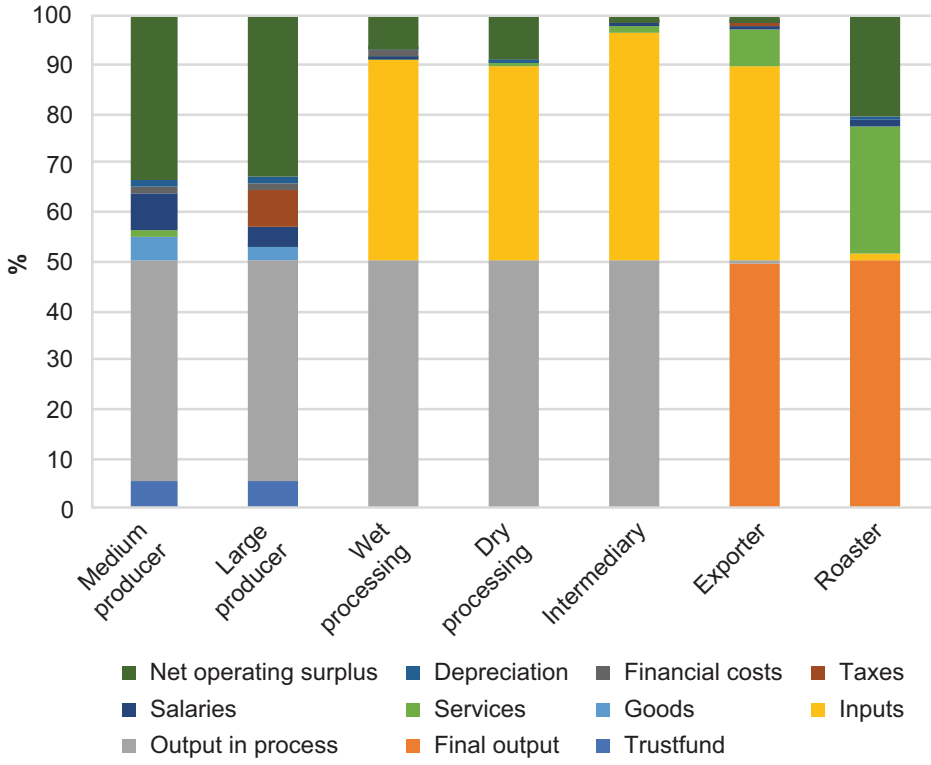

Figure 6 Cost structure in the certified coffee value chain in Honduras

collection costs to reward the traditional intermediaries and also pays higher costs to licensed exporters (see also Figure A2 for further disaggregation).

Taking a closer look at the cost structure of each of the value chain agents (see Figures 6 and 7) confirms the large operating surplus share received particularly by medium-size certified producers. Larger certified producers face, however, a considerable taxing disadvantage. Cost differences in processing are of minor importance, but local intermediaries and exporters receive a larger share in the conventional coffee value chain. Finally, there seems to be an interesting economic potential for certified (mostly organic) coffee roasting for sales at the national market.

Macroeconomic implications

Based on the value added calculations and information on the cost share of key coffee inputs (such as labour, fertilizers, gasoline, and equipment) we could also assess the differences between conventional and certified (differentiated) coffee sales according to macroeconomic performance indicators. The higher cost/benefit ratio for conventional coffee illustrates that production relies more on substantial (purchased) inputs, whereas certified coffee production is relatively more labour-intensive.

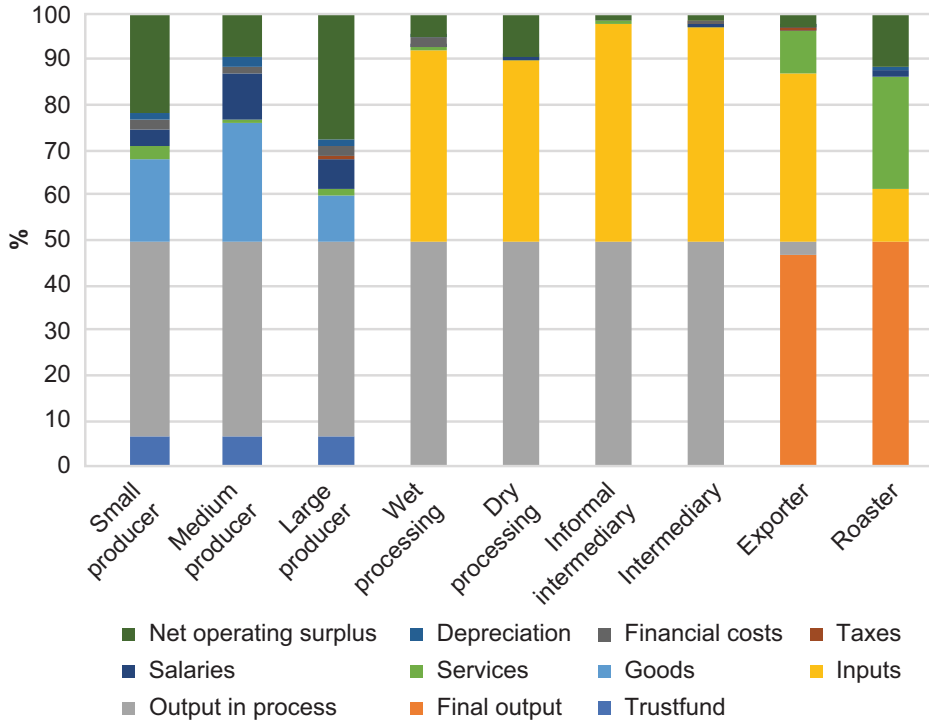

Figure 7 Cost structure in the conventional coffee value chain in Honduras

Domestic resource costs for coffee production represent between 0.13 and 0.27 of all costs, with a higher share for conventional coffee. This means that a surplus remains after considering the use of several critical inputs (fertilizers, sacks, depulping machinery, etc.) that have to be imported from abroad. Consequently, net foreign currency generation from coffee exports is lower for conventional coffee compared to certified coffee. Otherwise, domestic profitability is higher for conventional coffee due to the larger proportion that is processed and sold at the local market at relatively high margins.

It can be said that the coffee sector in Honduras receives little state protection as the rate of taxation is no higher than 6–7 per cent of the production value. Conventional farmers are slightly more favoured than certified farmers since they use relatively more market-based inputs (fertilizers, pesticides, and herbicides) that face higher shadow prices. Recent support measures of providing fertilizers to smallholder producers are helpful to maintain coffee yields despite agroclimatic shocks, but also decrease their net foreign exchange contribution.

Environmental effects

Most individual farmers that process conventional coffee rely on traditional (extensive) or slightly improved production systems processing facilities, whereas organized farmers delivering differentiated coffee to certified outlets have shifted

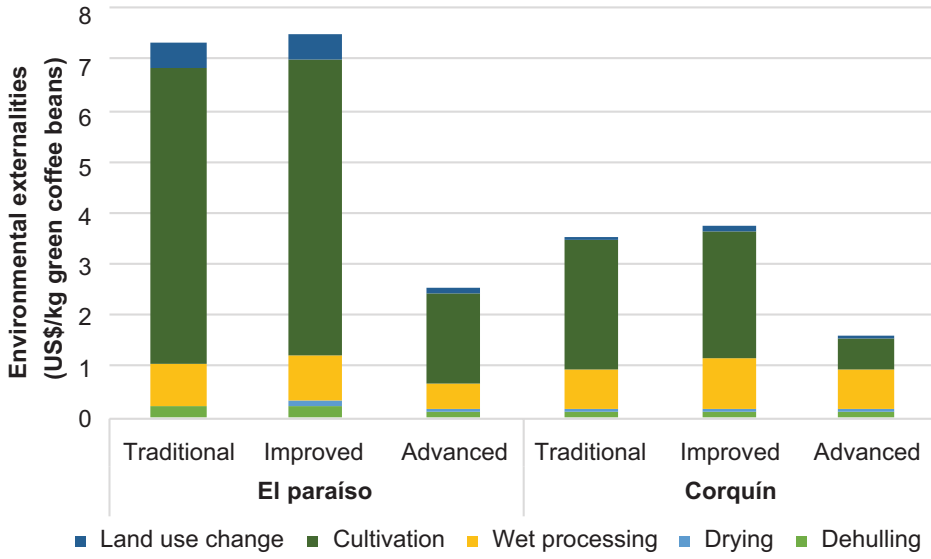

Figure 8 Environmental externalities of different coffee systems in El Paraiso and Corquín

to more advanced production and processing methods that have higher input use efficiency and generate fewer externalities.

The environmental externalities of the coffee sector are estimated between $1.6 and $7.5 per kg of green coffee beans, depending on the production system and field site (see Figure 8). Assuming the traditional system in El Paraiso and Corquín represent respectively 35 per cent and 10 per cent of the national production, the improved system 10 per cent and 30 per cent, and the advanced system 5 per cent and 10 per cent, the national average environmental externalities of green coffee beans is estimated at $5.1 per kg. Blackman and Naranjo (2012) report lower estimates of environmental benefits for organic coffee in Costa Rica, but they only focus on primary production. Bose et al. (2016) indicate that in Vietnam coffee certification only enforces modest changes in farm management practices, whereas Maguire-Rajpaul et al. (2020) show for Brazil that compliance with social standards is higher with group certification.

The total production of green coffee beans in Honduras in 2020/2021 was 5.5 million 46-kg bags. The total external cost of the environmental impact due to coffee production in that year in Honduras would therefore be $1.3 bn. Note, however, that this is a conservative estimate, particularly because there is no consensus on the social cost of CO_2, which may range from $21 to $900 per tonne CO_2 (Ackerman and Stanton, 2012), where $220 is assumed here as a plausible estimate to determine the external costs (Fitzpatrick et al., 2017).

The main contributing factors of these externalities are greenhouse gas emissions from deforestation, fossil fuel use, and fertilizer use, and methane emissions from wet processing resulting in: climate change; land use (occupation

and transformation); water pollution leading to marine eutrophication; air pollution leading to terrestrial eutrophication, terrestrial and freshwater acidification, and respiratory diseases; and fossil resource use leading to resource scarcity.

The most relevant life cycle stages are cultivation (including land-use change) and wet processing. The traditional systems have a somewhat lower impact than the improved systems because the wastewater from the wet processing in the traditional system is disposed of in the rivers, where no methane emissions occur and there is seemingly little impact on the biodiversity. However, no other external costs are included in the analysis due to lack of information, though various stakeholders mentioned the loss of animal production and reduced fish stock in the rivers. The methane emissions in the improved systems are prevented in the advanced systems by capturing them in biodigesters for use as fuel, though implementation, maintenance, and operation of biodigesters is too costly at the moment to be economically viable without subsidies.

The environmental externalities of dry processing in improved and advanced coffee systems are higher because most of the coffee is dried in machines rather than using sunshine on the ground. The differences between the two sites and between the traditional/improved and advanced systems are mainly due to the differences in yields and related fertilizer use efficiency.

Discussion and outlook

The coffee sector in Honduras has benefited from high growth rates and substantial improvements in crop yields. Certified (differentiated and organic) coffee represents an important and growing segment of coffee production that is more vertically integrated with processing and exporting activities. The higher income share for farmers and the larger net currency contribution make certified coffee both micro- and macroeconomically attractive. Certified coffee from Honduras also competes favourably in terms of environmental externalities. The growth potential of the coffee sector can still increase considerably if both public investment (infrastructure) and private investments (credits, inputs) are intensified.

The competitiveness of the Honduran coffee value chains has certainly been modified by the Covid-19 pandemic and other natural disasters. Access to critical inputs and (migrant) labour became constrained, but the government response to provide access to fertilizers effectively mitigated the expected yield and production decline. On the other hand, within the coffee value chain, the bargaining position of intermediaries vis-à-vis processors improved and the share accruing to primary producers is likely to be affected by volatile market prices (Guido et al., 2020).

Certified coffees guarantee a higher income share to (most medium size) farmers that are engaged with integrated wet and dry coffee processing facilities through their cooperative organization. In addition, these cooperatives have licences that enable direct export transactions and negotiations for receiving premium prices.

Consequently, certified farmers receive value-added both through production and processing/marketing.

Environmental effects tend to be also more positive for certified and organic farms that rely on more local inputs (animal manure; composting) and can recycle the coffee factory residues for farm-level nutrient management. Moreover, more input-intensive coffee cultivation (in Corquín) brings production closer to its potential, and consequently, emissions per unit of output will be smaller. Given the imminent changes in rainfall pattern and temperature (related to climate change), shade and moisture management practices become critical for resilient coffee production.

Further growth of the coffee sector in Honduras may benefit from a concerted strategy that includes three basic components:

1. Focus on organic certification that receives a higher price premium at international markets. Whereas certification as such only generates modest additional revenues for local farmers and processors, price premiums paid for organic coffee are substantially larger. Organic production creates more local employment (for mulching and weeding activities) and is particularly relevant for enhancing the sustainability of the coffee sector.
2. Attention for upgrading through yield and quality improvement, making use of better pruning of the coffee tree, and keeping quality more consistent (homogeneous) during processing. Future demand for coffee is shifting to premium segments that particularly value taste, origin, and flavour. Improving coffee quality requires substantial investments in processing and business management (Paseto et al., 2018). Long-run competitiveness of the Honduran coffee sector can only be based on quality upgrading leading to more rewarding export prices.
3. Growth in local processing of traditional coffee and further developing coffee sales at local coffee shops. While coffee is mostly perceived as an artisanal product that can be delivered through short supply chains, consumers prefer sales by locally owned coffee shops and value high-quality and specialized coffee products such as flavoured coffee. They are also willing to pay more for a unique coffee experience that impacts all senses. As a result, coffee roasters and baristas incorporate new techniques for upgrading the properties of coffee (PRF, 2021). This strategy is particularly favourable for strengthening prospects for midstream inclusion.

This strategy differentiates coffee development for specific types of market outlets. Coffee intensification for value creation at international markets can take place in high-potential areas (Corquín), whereas value-added creation through local processing receives priority in more marginal areas (El Paraiso). In addition, better integration of the coffee value chains supports more circular production systems based on nutrient and water recycling (from factory to farm). Finally, it is expected that certified coffee systems can also become more resilient to climate change, maintaining stable yields, and homogeneous quality.

These dynamic comparative advantages of coffee certification are usually overlooked in common impact studies but deserve more serious attention as part of the sector transformation that is taking place in the Central America coffee sector. Linking insights from production systems, midstream value chain integration, and market differentiation may provide new perspectives for coffee sector development and a new rationale for coffee certification.

Acknowledgements

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Appendix

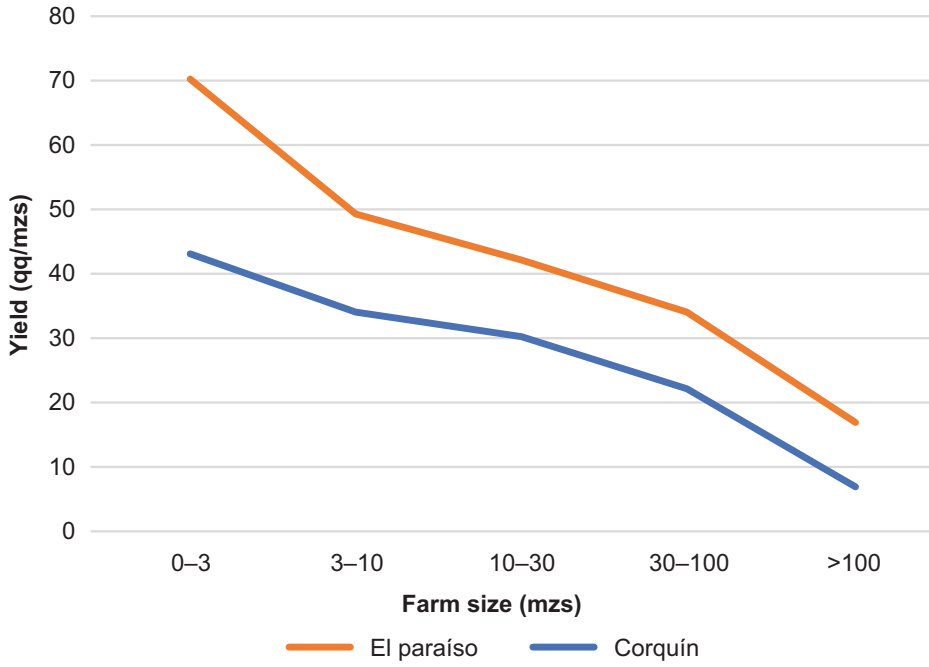

Figure A1 Farm size and coffee yields in Honduran coffee zones
Note: 1 quintal equals 46 kg; 1 manzana equals 0.7 hectare

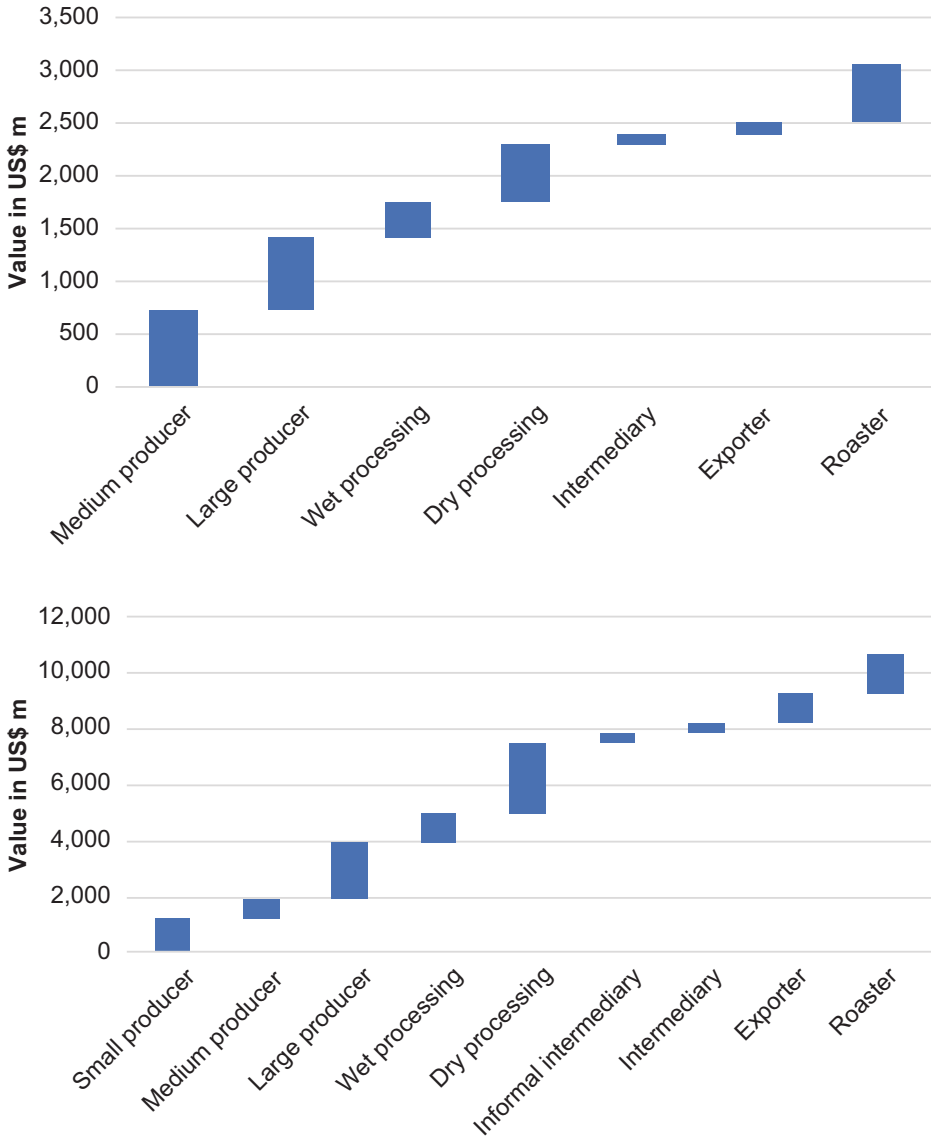

Figure A2 Surplus distribution (a) certified coffee chain; (b) conventional coffee chain

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